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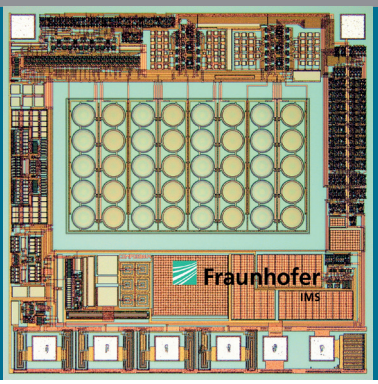

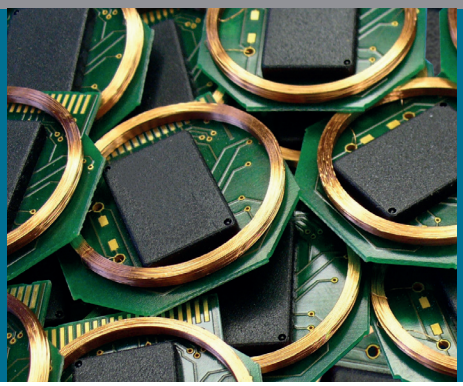

1 *Pressure and temperature ASIC.*
2 *Sensortransponders.*

SENSOR TRANSPONDER EVALUATION KIT

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A Sensor-Transponder has been developed for the remote measurement of absolute pressure and temperature in the fields of industrial environments. The device is fabricated in one monolithic CMOS-chip which increases reliability and reduces fabrication costs.

Pressure Sensor

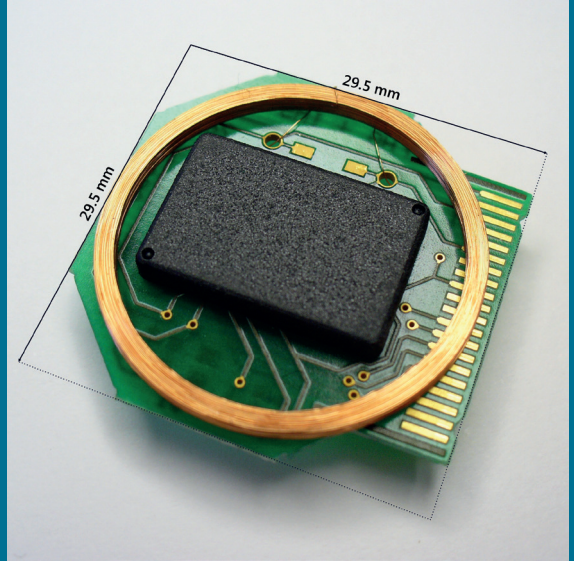
The integrated capacitive pressure sensor, as shown in Figure 1, consists of an array of circular sensor elements. Each capacitor of a pressure sensor is formed by a fixed first electrode in the substrate and a second electrode as a deflectable membrane of polycrystalline silicon above. The cavity under the membrane is obtained by anisotropic etching and later vacuum sealing.

Sensor Readout Electronics

The on chip sensor readout electronic consists of a selection circuitry which switches between the pressure sensor and temperature sensor for readout, a special ultra low power A/D-converter and a wireless communication link for data transmission. A typical pressure curve for raw sensor data is shown in Figure 5.

Transponder System

The system consists of a passive transponder equipped with sensors, and a reader device which powers the transponder by an electromagnetic field and receives back information from the transponder (Figure 3). In this system load-modulation is used to transmit data from the transponder to the reader. Therefore, the impedance of the transponder is changed and modulates a carrier wave which is generated by the reader. The transmitted data package comprises of the sensor readout data, calibration data, a unique identification number and a checksum for data validation. The reader unit calculates the measured pressure and temperature out of the received data. The operating distance is in the range of 0 to



15 cm. As external components for the ASIC, only an antenna based on a coil with a resonance capacitor and an additional capacitor for smoothing the operating voltage are necessary, reducing cost and increasing reliability of the system (Figure 4). The sensor is calibrated in a fully automatic way, storing the calibration coefficients for pressure and temperature in the onchip and system EEPROM.

Applications

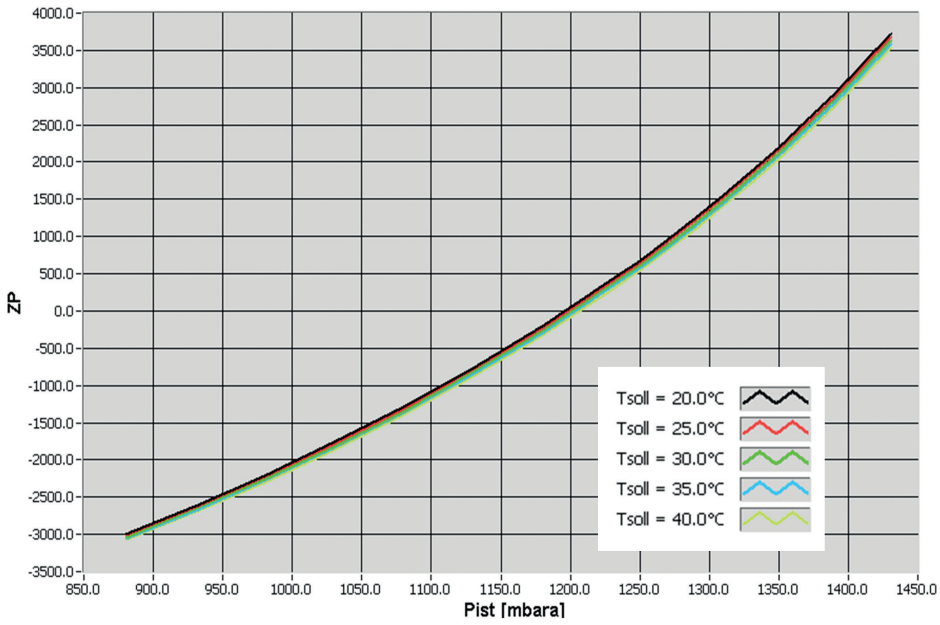
Due to the low cost, small size and the high performance of the system, it is ideally suited for many applications such as:

- Remote pressure and temperature measurement in machines
- Remote pressure and temperature measurement in rotating parts
- Control of vacuum isolation panels
- Control of vacuum in insulating glass panes

Evaluation Kit

The evaluation kit consists of the handheld reader and a set of e.g. 10 fully calibrated sensor transponders, as shown in Figure 4.

Parameter	Value
Handheld reader size (l, w, h)	233 mm, 138 mm, 117 mm
Handheld reader HF-frequency	133 kHz
PC-Interface	USB
Li-ion Accu	7.4 V, 1000 mAh
Charging Device	Li-ion-charger, input DC 12 V
Sensor transponder size (l, w, h)	29.5 mm, 29.5 mm, 7 mm
Sensor weight	2.5 g
Max. pressure range	5 – 1250 hPa
Pressure sensor accuracy	± 2.5 hPa @ (800 – 1200 hPa)
(other pressure ranges are possible)	± 5 hPa @ (5 – 50 hPa)
Max. pressure sensor sample rate	44 Hz
Temperature range	-20 – +85 °C
Temperature sensor accuracy	1 K
Temperature sensor sample rate	22 Hz
Operation distance	0 – 15 cm
(depends on surrounding materials)	



3 *Handheld reader unit measuring sensor transponder.*

4 *Size of sensor transponder.*

5 *Typical raw pressure curve.*